

Sheep and goats for diverse products and profits

FAO Diversification booklet 9



Diversification booklet number 9

Sheep and goats for diverse products and profits

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■ Preface	v
■ Acknowledgements	vii
■ Contribution of sheep and goats to sustainable livelihoods	1
■ Market opportunities	5
■ Growth in market demand for small ruminants and their products	5
■ Benefits of keeping sheep and goats	7
■ Outputs from small ruminant production	7
■ Dietary contribution of meat and milk products	8
■ Benefits at the household level	10
■ Benefits to the farming system	12
■ National benefits	15
■ Inputs to small ruminant production systems	17
■ Using the right species and breed	17
■ Sources for replenishing stock	17
■ Keeping livestock healthy	18
■ Supplying adequate feed and water	18
■ Grazing as a way of using local feeds	19
■ Using local materials to make livestock housing and equipment	21
■ Labour needs	22
■ Preserving livestock products	22
■ Adding value to livestock products	23
■ Support services for small ruminant production	27
■ Sustainable services for all	27
■ Access to technical and commercial information, loans and credit	29
■ Veterinary services	30
■ Access to technologies and training	31
■ Input supply chains	31
■ Markets for produce	31
■ Transport	32
■ Potential for establishing cooperatives and women's groups	32
■ Food safety regulations	32

■ Challenges and opportunities	35
■ Selected further reading	37
■ Sources of further information and support	41

Table of contents

Preface

The purpose of the FAO Diversification booklets is to raise awareness and provide decision support information about opportunities at farm and local community level to increase the incomes of small-scale farmers.

Each booklet focuses on a farm or non-farm enterprise that can be integrated into small farms to increase incomes and enhance livelihoods. The enterprises profiled in the FAO Diversification booklets selected are suitable for smallholder farmers in terms of resource requirements, additional costs, exposure to risk and complexity. The products or services generated by the enterprises are suitable for meeting demand on a growing, or already strong, local market and are not dependent on an export market.

The main target audience for these booklets are people and organizations that provide advisory, business and technical support services to resource-poor small-scale farmers and local communities in low- and middle-income countries. It is hoped that enough information is given to help these support service providers to consider new income-generating opportunities and how these might enable small-scale farmers to take action. What are the potential benefits? What are farmer requirements and constraints? What are critical ‘success factors’?

The FAO Diversification booklets are also targeted to policy-makers and programme managers in government and non-governmental organizations. What actions might policy-makers take to create enabling environments for small-scale farmers to diversify into new income-generating activities?

The FAO Diversification booklets are not intended to be technical ‘how to do it’ guidelines. Readers will need to seek more information or technical support, so as to provide farmer advisory and support activities relating to the introduction of new income-generating activities. To assist in this respect,

each booklet identifies additional sources of information, technical support and website addresses.

A CD has been prepared with a full series of FAO Diversification booklets and relevant FAO technical guides, together with complementary guides on market research, financing, business planning, etc. Copies of the CD are available on request from FAO. FAO Diversification booklets can also be downloaded from the FAO Internet site.

If you find this booklet of value, we would like to hear from you. Tell your colleagues and friends about it. FAO would welcome suggestions about possible changes for enhancing our next edition or regarding relevant topics for other booklets. By sharing your views and ideas with us we can provide better services to you.

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Contribution of sheep and goats to sustainable livelihoods

Almost three billion people, or almost half of the world's population, live on less than US\$2 per day. More than 1.2 billion of these, or about 20 percent of the world population, live on less than US\$1 per day. Poverty is largely, but by no means only, a phenomenon of the rural areas. Effective poverty reduction measures can only be successful if the livelihoods of the rural poor can be improved.

Sheep and goats belong to the group of animals called small

ruminants. Small-scale farmers keep small ruminants for both subsistence and economic reasons and, in either role, they generally improve household livelihoods, but they have the capability to do much more. Small ruminants contribute to landless, rural farming, peri-urban and increasingly to urban households by providing food, heat, income, socio-cultural wealth and clothing (see Figure 1).

They also make important indirect contributions to households through



*FIGURE 1 Contributions to human welfare (sheepskins in Aranghai Province, Mongolia, that will be cured for home use and for sale as winter clothing)
(Photo by R. T. Wilson)*



FIGURE 2 Boy herding goats in Niger
(Photo: © FAO/23786/R. Lemoyne)

the use of crop by-products, integration with other farming enterprises, use of household wastes and locally grown vegetation, soil fertility improvements and their roles in the social, cultural and religious aspects of everyday life. In particular they contribute to the empowerment of women and of children who often have responsibility for the management, production and health of small ruminants (see Figure 2). At the regional and national level, sheep and goats contribute to supplying markets with food and non-food products with export-earning and import-saving potential.

Small ruminants, such as sheep and goats, fit well into smallholder

farming systems. The species of animal reared (sheep or goats or both) in smallholder systems differ by region, country, and ethnic and religious groups. Their grazing preferences enable them to feed on weeds, shrubs and other plants that other species of domestic animals tend to refuse. Their small size means they require less space than larger animals and they are less likely to damage and compact soils. They are easier to work with than large ruminants and are cheaper to buy and maintain. Moreover, under the right conditions, they can be quite prolific, but this fact is not well known. The range of products produced by small ruminants is easy to market because

demand is high, yet largely unfulfilled.

Although these animals are distributed widely throughout the world, the potential of sheep and goats is often not realized. Policy-makers and administration tend to overlook their contributions to the economy, rural and peri-urban livelihoods, the empowerment of women, other marginalized groups and food security. At the household level, they often survive by scavenging, thereby losing a lot of their productive potential. Hence, there are considerable opportunities for small livestock keepers to use their animals more effectively and

efficiently, and thus increase their contribution to improved livelihoods, underpinned by a comprehensive range of support services.

Hence the aim of this booklet is threefold:

- to highlight the benefits of keeping sheep and goats;
- to identify the key inputs into smallholder livestock systems to improve productivity;
- to identify the range of support services required and the challenges of service provision.

Market opportunities

■ *Growth in market demand for small ruminants and their products*

The huge demand that is predicted to arise for livestock products in the first quarter of the 21st century, driven almost entirely by population growth, rising incomes and increasing urbanization in developing countries, presents an opportunity for small livestock producers. They can exploit these markets in order to increase their income, employment and social development and to improve the sustainability of their farms. Most of the increased demand will be in the larger, and still expanding, towns and cities and this will be of particular benefit to peri-urban farmers. Wherever the farms are located, the successful marketing of products will be critical.

A key factor in any marketing chain, and often overlooked by farmers, is consumer needs and the choices available to them. Producers must provide what is required by consumers, otherwise prices are likely to be low or goods will remain unsold. Although this sounds obvious, it needs to be addressed

in order to create more sustainable farming systems. The rise in demand for livestock products is commonly associated with higher levels of disposable income and an increasing level of sophistication amongst consumers. In such a situation, consumer demand for livestock products will increasingly be based on quality as well as supply regularity at a reasonable price. Low prices may not be so critical in success as disposable incomes rise. Successful small farm enterprises will need to know what the market requires and be able to respond to it. Traditional markets may well continue to exist, but these new markets represent a challenge to small farmers who will need to be well organized to capitalize on these additional opportunities.

The ability to respond to market demands is an important factor in being able to make the most of new and expanding market outlets. This may be in terms of the type of product required or for the quality standards desired by new consumers of animal products. If small farmers want to respond to such consumer demands they may need to change the species

of livestock they keep as well as the products derived from them. They may also need to change the methods of processing and marketing that they typically use. Farmers should be encouraged to adapt their farming systems to meet consumer needs, but will require policy and practical support to enable them to achieve these changes. This may take the form of training, credit, additional services or advice which should be delivered with the target group clearly identified.

While traditional markets in rural areas will continue to be important, more modern outlets including supermarkets are likely to be the prime mechanism for delivery to meet the increased urban demand. In these circumstances, it is unlikely that individual small farmers will be able to respond to demand on their own. The creation of cooperative or joint marketing ventures seems the most likely way forward. These may be owned by the farmers themselves or operated by entrepreneurs with the necessary infrastructure and experience to make them work. Farmer-owned cooperatives have the advantage that the farmers themselves are in control of the operation and will benefit directly from the increased income streams

and increased sustainability that will follow. If farmers lack the skills required to make such an operation work effectively, an entrepreneurial marketing system may be a more efficient and effective operation, but farmers will lose control over the pricing and marketing of their products once they leave the farm. Innovative forms of linking producers to markets, such as the formation of strategic alliances between farmers, processors and supermarket chains, are further options to be considered.

The nature of the product will influence the type of marketing system needed. Highly perishable products transported to distant markets will require a much greater investment in infrastructure than less perishable products (for example, fresh milk in comparison with salted meat). Integrated marketing chains including food processing and supply to the retailer may be necessary for dairy and meat products. The more sophisticated the supply chain, the more removed farmers are likely to become from the selling process. Although well-trained professional staff may be more effective in such operations, it may represent additional risks to individual small farmers and may make their farms less sustainable in the long-term.

Benefits of keeping sheep and goats

■ *Outputs from small ruminant production*

The outputs from small ruminant animals can be grouped into products, by-products, and indirect and intangible benefits (see Table 1). Immediate products include meat and milk and their processed products such as cheese, wool and

hair (including mohair) and skins and other minor ones. Economic and environmental benefits are derived from dung (which improves soil fertility and structure) and from nutrient recycling. Indirect benefits, representing those benefits that are not the primary purpose for keeping the animals, include weed control.

Table 1 Benefits from small ruminants

Products	By-products	Indirect benefits	Intangible benefits
Meat	Manure as fertilizer	Weed control	Reduction and spread of risk from crop operations
Milk			Generation and accumulation of capital
Skins			Generation of income and smoothing out cash flow
Fibre	Dung as fuel and for biogas production		Fulfilling social, cultural and religious needs and obligations
Horns			Providing status or prestige in the immediate community
Offal			Use in sport, culture and recreation

Perhaps of equal importance are the notional outputs of wealth, status, security and the even less tangible social benefits of empowerment, self-esteem, pride and social interaction and inclusion which small stock can engender (see Case Study 1). In many societies livestock also have religious and cultural significance.

■ *Dietary contribution of meat and milk products*

Small ruminants (as indeed all animals) provide the potential for a

more varied and healthier diet than that obtained from a pure crop system. Meat and milk and their processed products provide a more interesting nutritional regime for the household and also supply the minor but essential nutrients (minerals and vitamins) as well as the major nutrients (protein and energy) in the form of fats and carbohydrates.

Animal products that are edible can contribute significantly to the improvement of household health and are particularly valuable for children.

CASE STUDY 1 Sheep as an economic and cultural asset in Mexico

In the Tzotzil area of Chiapas, Mexico, sheep husbandry is culturally linked to the responsibilities of the female head of the household. The sheep are kept primarily for wool production, but play a secondary role in other agricultural and cultural aspects of the household. Wool production is traditionally linked to clothes production and is associated with a considerable amount of indigenous knowledge both in sheep husbandry and in processing wool.

Sheep husbandry has a direct impact on annual household income. Tzotzil women generate direct income through the sale of sheep, fleeces, woollen clothes, woollen handicrafts and manure. Sheep also increase crop yields in manure-fertilized cropland, which results in increased income when the crops are sold. Sheep represent 30 percent of total income in Tzotzil villages.

Fleeces produced in the household, plus some bought in the market, are hand-processed into traditional Tzotzil clothes for the family. Fleeces are washed and carded, spun using a spindle, and woven by means of an ancient back-strap loom. These activities may not represent an economic use of resources, but the cultural output is a key factor in this system and sheep play an important role in this context.

Toztzil women have developed their own system for measuring wool production, using subjective estimates of greasy fleece volume and quality, which correspond well with the more objective measures used in the commercial wool industry. Wool has cultural meaning, social importance and economic implications in this society. Any interventions targeting sheep husbandry have to take all these factors into account.

Animal products provide the best quality protein in the human diet. Low animal protein intake can result in a high incidence of Kwashiorkor in children (malnutrition caused by inadequate protein intake despite a fairly good total calorie intake), high infant mortality, malnutrition in adults, and a general weakening of the body which predisposes it to disease. A restricted protein intake also leads to disturbances in growth and development in children that extend not only to physical but also to mental development.

The recommended total minimum protein intake for an adult is 85.9 grams daily of which 34 grams (40 percent) should be of animal origin. Animal products supply about 17 percent of the energy and 32 percent of the protein eaten by people. Although there are considerable regional differences regarding the role of animal products in the diet, the main source of future demand will come from developing countries as incomes increase and the demand for a more varied and higher quality diet intensifies.

Meat and meat by-products

Meat and its products are sources of high quality protein. The composition of amino acids in meat usually compensates for deficiencies arising in staple diets relying largely on

cereals. Meat also supplies iron that is easily absorbed and assists with the absorption of iron from other foods, in addition to assisting the absorption of zinc. These products are also rich sources of some group B vitamins.

Milk and dairy products

Milk is a fundamental product in human nutrition. It is the neonatal or 'baby' food of all mammal species. The milk of many species of domesticated animal is generally suitable for human consumption. Milk is an important source of dietary protein and calcium, which are important for growth and bone formation. Potassium, phosphorus and trace elements are also present in milk. Milk is also usually a good source of vitamin C, vitamin B12 and some other B complex vitamins (riboflavin and thiamine) and of carotene, which is the precursor of vitamin D.

In many nomadic societies and in many small mixed crop livestock systems, goats and sheep are the major source of milk for the family even though production per individual animal is small. Some people are intolerant of lactose, especially in bovine milk, but many are able to use the milk of other species. Goat milk is often a substitute for cow milk in these cases and is well tolerated by almost everyone.

In addition to its value as a food, milk has (and is often considered to have) medicinal properties. In some societies, and for some species of animal, milk is also believed to have magical properties.

■ *Benefits at the household level*

Income and food security

The presence of sheep and goats around the home or garden can provide immediate daily food particularly in the form of milk and its products. Small ruminants not only provide food security through ready accessibility, but they also increase the diversity of food and cash sources and thus reduce the risk that might otherwise be associated with limited food and cash supplies.

Small livestock also improve household assets by providing fuel, clothing and additional sources of income. For example, value can be added to meat by preservation and making better use of by-products including the offal for food, intestines for sausage skins and various organs in cosmetics or as traditional or modern medical products.

Empowering women and children

Women and children are usually the managers, if not actually the owners, of small ruminants. They derive some socio-economic benefits from this

activity, not only in terms of access to food and cash (this may be their only source of cash), but also through more subtle changes in their status. This may arise from the empowerment conferred on managers of livestock, and the sense of purpose and cultural identity that may follow, for example, through participating in training and extension activities.

Special role in poverty alleviation

Small ruminants contribute to the livelihoods of all their owners, but particularly to the poor and otherwise marginalized groups including the chronically sick or families that have been affected by sickness (see Case Study 2). This is achieved by:

- providing food and other products directly to their owners;
- being one of the few assets readily available to the poor thus being crucial in maintaining household survival during crisis;
- acting as an important component of farming systems through increasing the diversity of production, lowering risk, and reducing fluctuations in cash flow especially in harsh environments;
- contributing to environmental objectives and the sustainable use of resources through the effect of manure on soil quality and water retention;

- assisting marginalized groups and the poor to obtain private benefits from common property resources;
- making the difference between survival and abject poverty for various types of producers including pastoralists, share croppers and part-time farmers;
- acting as a readily available ‘current’ account that can rapidly be sold when short term needs arise for small or medium accounts of cash and as a ‘capital’ account that can be accumulated for longer term and more substantial needs;
- allowing and encouraging access to social support networks and cultural and social well-being.

Using local feedstuffs and feedstuffs not suitable for human consumption

Many small ruminants exist on by-products from crop production (see Figure 3), on tree fodder (leaves, twigs and fruits) and on household wastes. The use of these by-products for livestock feed confers a value on them that they would not otherwise have.

They also contribute to the production of food and other animal products from what would otherwise be waste. This increases the efficiency of the household and farm system and effectively recycles waste materials.

CASE STUDY 2 An AIDS orphan in Uganda

Ruth is an AIDS orphan. Both her parents died when she was 13 years old and she had to move, together with her two younger brothers, about 250 kilometres to live with her aunt and her grandmother. At 15 she is doing very well at school and was chosen to receive goats from FARM-Africa because the income from the goats would enable her to carry on with her schooling. Ruth says:

“My grandmother is now getting old and is unwell so it is important that, as well as going to school, I work to help my brothers. The goats will mean that the three of us can complete school as not only we will have milk for the family, we will have extra that we can sell”.



*FIGURE 3 Sheep grazing on barley stubble
(Photo ICARDA)*

■ *Benefits to the farming system*

Recycling nutrients in the soil

Small ruminants play an important role in recycling nutrients in the soil. The use of crop wastes as feed facilitates the return of nutrients to the soil via the production of manure and urine.

However, manure has to be treated carefully. If fresh manure has a high roughage content, micro-organisms will have difficulty in decomposing it, hence there will be a loss of nutrients

caused by run-off or volatilisation.

It is best that manure is composted over a period of time. This enables the breakdown of roughage and the decomposition of weed seeds that lose their germinative power. Harmful substances in the first stage of decomposition are also eliminated.

The careful management and use of manure and urine can result in improved soil fertility, improved soil structure and higher humus levels, thereby increasing crop production.

Integration with crop/horticultural production

Combinations of crops and livestock in the same farming system is usually mutually beneficial (see Case Study 3). This is caused by the recycling benefits mentioned previously, but also in part from the complementary

requirements of crops and livestock in many situations. Arable rotations on the farm, relay cropping in the garden, or permanent tree crops frequently include stock grazing on crop material in the field for their deposits of manure and urine.

CASE STUDY 3 Mixed livestock-crop farming in the Central African High lands (Rwanda, Burundi and Eastern Zaire)

This system is characterized by intensively cultivated areas at altitudes higher than 1 500 m. Individual holding sizes are very small, averaging less than 0.9 ha (of which 0.75 ha is under food crops). The main crops are banana (mostly for brewing beer, with cooking and dessert bananas being much less important), annual subsistence and cash crops. Haricot beans, cassava and sweet potatoes are grown in association with bananas. The many minor crops include pigeon peas, maize, sorghum, various cucumbers and gourds, groundnuts, Irish potatoes and cocoyams or taro, and a great variety of green vegetables. The aim is to provide a constant supply of food throughout the year. A few trees (mostly Cupressus and Eucalyptus) assure a supply of fuel and coffee provides cash income. Cropping patterns are influenced as much by social factors as by climate and soils.

The highlands are rarely considered to be important for livestock, but almost all families own ruminants and poultry. Cattle used to be important culturally, but the high human density (more than 600 people per km²) has resulted in greatly reduced numbers. In the past there were taboos against eating sheep meat in some areas, but these are fading and the rearing of both goats and sheep is being encouraged by the political authorities and extension agents. Animals are closely integrated in the whole system. Almost all families own at least one species of ruminant and many own three. The number of animals owned is small but varies, as does the mix of species, with ecological zone. They are used for subsistence and to generate cash.

Agricultural by-products are fed to animals by over 80 percent of owners; the type and amount of which varies seasonally including banana leaves (mostly in the short dry and rains seasons), sweet potato vines and peelings (mostly in the long dry season) and haricot beans. The provision of green fodder, supplementary to grazing, is common, with many farmers growing forage for this purpose. Manure is collected and spread directly on the arable land or composted with waste produce from the farm or house.

Animal productivity is well below optimum because of poor extension services, inadequate veterinary support and a lack of market information. These problems are not insurmountable and if services could be provided, and coupled with the use of anti-erosion terraces for growing forage grasses and tree legumes such as *Leucaena leucocephala* to improve animal nutrition, livestock output could be improved considerably.



*FIGURE 4 Local housing for sheep and goats in Togo
(Photo by R. T. Wilson)*

Input requirements

Where there is the potential for choice of possible uses of resources, small ruminants offer several advantages over many other enterprise options. The needs of sheep and goats are less than for larger livestock:

- the initial cost of the animals is small;
- they can use waste household resources;
- they can be kept near the home;
- they need less feed and water in cut-and-carry systems;

- they often do not require specialized housing (see Figure 4);
- they are suited to a scavenging or partly scavenging production system.

Contribution to peri-urban livelihoods

The huge increase in the urban populations, many of whom have a rural background and have little cash to buy food, has led to a large number of peri-urban livestock keepers. The systems of production rely more on scavenger grazing, household

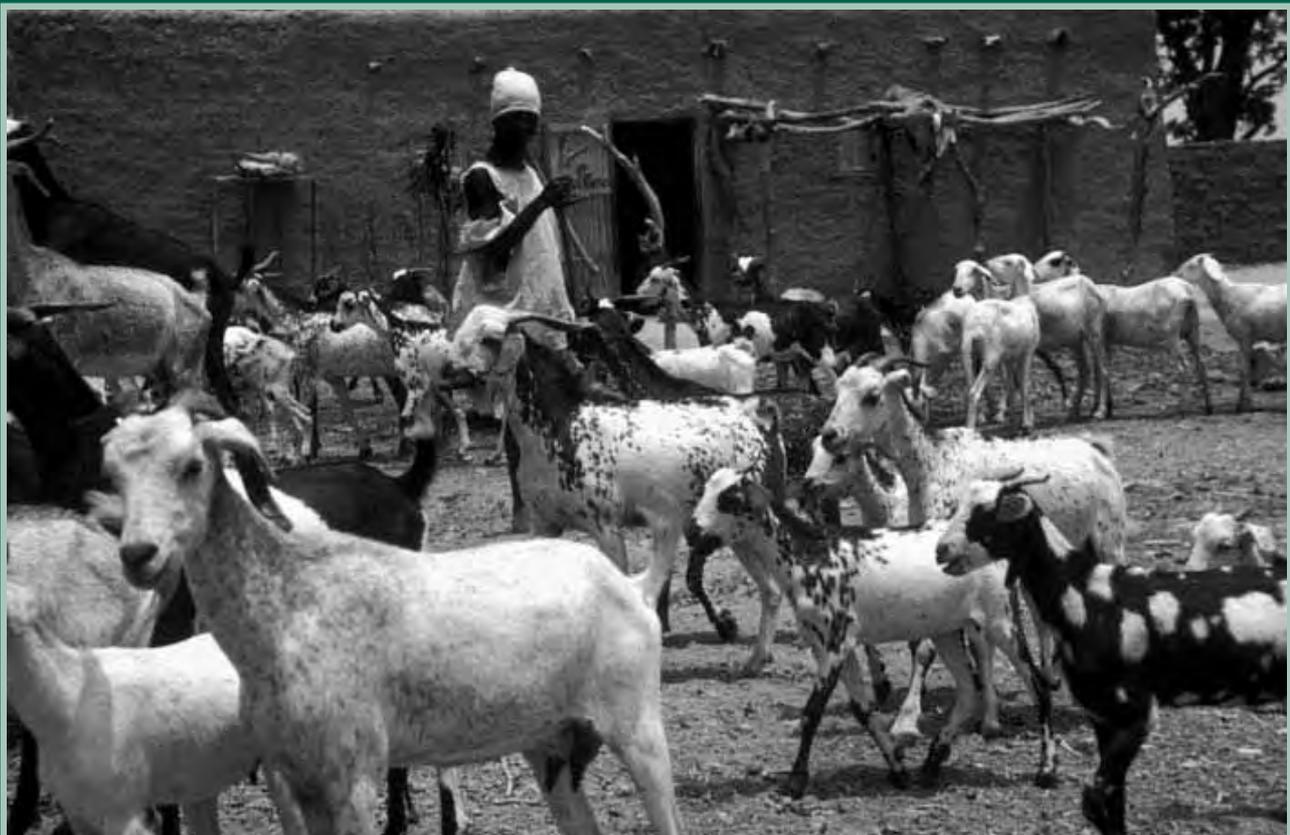


FIGURE 5 Goats on their way to market in Mali
(Photo: © FAO/10995/J. van Acker)

waste, small gardens, with purchased feed as a source of nutrients. In this environment, farming is not the major occupation or source of income for the family but, nevertheless, the small livestock play an important supporting role.

■ *National benefits*

Sheep and goats contribute to the national economy by, among other things, providing food. The collective contribution of many tens or perhaps hundreds of thousands of producers of small ruminants supply very large

numbers of animals to home markets and thereby help reduce imports. These animals, in particular, provide further downstream opportunities for processing industries based on livestock products, such as milk processing or skins. There may also be the potential to export live animals and their products.

This is an example of the win-win situation of the small ruminant sector whereby, not only is foreign exchange conserved by home production, but also gained through supplying export demand (see Figure 5).

Inputs to small ruminant production systems

■ *Using the right species and breed*

The basic unit of production in all livestock systems is the animal. Selecting or using the best genetic resource for the function the animal is expected to fulfil and for the production environment is of critical importance. The right balance between productivity and health, fitness and adaptive traits is vital.

In most farming systems breeds or types have already been developed so that local livestock are adaptable to the local climate, system stresses and productivity requirements. Where natural or man-made disasters have devastated genetic resources or where new production requirements have become necessary, there may be a range of genetic resources suitable for these conditions.

The correct choice is crucial to future success and the correct balance between productivity and 'fitness' must be considered very carefully. The tendency to choose supposedly highly productive animals, while largely ignoring disease and climatic adaptation, is widespread, but the costs of coping with new disease or environmental

conditions add considerably to the costs of production. The choice of a species, breed or type that is well adapted to the total environment (climate, management, disease and feed availability) saves considerably on the resources that may otherwise be needed to offset the choice of the wrong animal (see Figure 6).

■ *Sources for replenishing stock*

All livestock systems require stock to be replaced at some time in the production cycle. It is important to arrange this replacement in the most appropriate and cost effective way. In many situations it is sensible to keep replacements from amongst the offspring produced on the farm. However, sometimes it is necessary to go outside the home environment, and the purchase of stock locally and of the same breed type may well be the 'best practice'.

Care must be taken not to use highly inbred stock that may result from the lack of introduction of new genes into the local population. The 'worst practice' may be the choice of exotic or imported stock because of their high production potential with



FIGURE 6 Improved rams (Djallonké breed) in Togo
(Photo: © FAO/19981)

no regard to their adaptation to local conditions.

■ *Keeping livestock healthy*

The maintenance of animals in a healthy state is an important factor in sustainable development. Animal health is a crucial aspect of production and it may also have implications for human health. An animal disease that affects or can be transferred to humans is known as a zoonose; examples include tuberculosis (most often transferred through drinking raw milk) and helminth infections that may involve animals and humans in alternative stages of a parasitic life cycle such as tapeworms.

The availability of affordable animal medicines and the routine (prophylactic) treatment of animals for diseases known to be present in an area are important aspects of livestock management. Hence producers need access to information and knowledge about the correct use of medicines.

■ *Supplying adequate feed and water*

A major objective of smallholder systems is to make them as self-sustaining as possible. This means that feeds and water as well as livestock resources are available. It may sometimes be necessary, however, to buy in feedstuffs



FIGURE 7 Blackhead Persian sheep grazing on rangeland under Mount Meru in Tanzania (Photo by R. T. Wilson)

from outside the farm that need to be appropriate in terms of quality and cost. If the local market does not supply appropriate feed resources, policies should be introduced or orientated towards providing locally grown and processed feed resources at a realistic cost. This will help provide a sustainable system for both growers and livestock keepers.

Better still, small stock keepers should be encouraged to grow their own feeds by using such techniques as intercropping, alley cropping, forage and multipurpose trees or local processing of arable crop products. Protein sources such as the by-products of oil extraction from arable

crops could be developed locally and the growing of alternative feed sources should be encouraged. Careful selection of plant species to provide the right balance of animal nutrients is crucial and might need to take into account the ecology of the rumen. Local roughage and carbohydrates are also important for ruminant systems for which by-products and residues from arable crops are a useful source.

■ *Grazing as a way of using local feeds*

Livestock obtain much of their nutritional need through grazing (see Figure 7). Not only are livestock able

to harvest feeds that suit their nutrient requirements but they can also:

- harvest material and turn it into useful products that would otherwise be lost to agricultural production;
- use natural grassland or rangeland areas that would otherwise provide little or no economic benefit (see Case Study 4);
- encourage re-growth of beneficial plant species in pastures;

- discourage the growth or invasion of an area by unwanted plant species;
- maintain landscapes and particular agro-ecosystems in a way that would not otherwise be possible.

Grazing or herding is often carried out communally and in an organized fashion that brings collective benefits to the whole community. However, too many animals on an area may

CASE STUDY 4 Goats and sheep as a multi-purpose species in Syria

In the semiarid areas of West Asia and North Africa, small ruminants play a key role in the use of by-products from arable cropping and utilize a break crop in arable rotations. They also provide a valuable means to recycle nutrients in a fragile agro-ecosystem and provide additional income to households, as well as contributing to religious and cultural aspects of everyday life.

In Northern Syria fat-tailed Awassi sheep are well adapted to the local climatic and farming conditions. They tolerate heat well and graze on a range of low quality forage sources, but also respond well to supplementary feeding or improved diets. Typical farming systems for the area involve wheat, barley, lentils, vetch, local lucerne varieties and watermelons in various rotations that often include a fallow period.

Sheep and goats fit well into these farming systems and receive a variety of feeds depending on the time of year and the stage of their reproductive cycle. Low quality feeds such as straw are widely used to cover an animal's maintenance requirements. In addition, steppe grassland, roadsides and marginal land are an important source of feed from autumn to early spring. High energy feeds such as barley and legume grains and industrial by-products (for example, cotton seed cake and citrus pulp) are also used to meet the nutritional needs of the animals.

The critical times of the year are winter and spring when the ewes are pregnant and lactating. The use of high quality supplements at these times helps both the animals and the natural pasture, which can be rested and allowed to set seed. The use of improved grazing in the summer (in the form of a specially grown forage crop) also aids the use of straw stubbles and helps prevent overgrazing on the fragile rangeland. Thus the rational use of a complex range of animal feeds supports sheep and goat production in a highly fragile environment.

lead to overgrazing. Careful attention should be paid to achieving the correct balance between the needs of the animals and those of the ecosystem, since this is critical to long-term sustainability. In particular situations this may require attention to questions of land tenure and access rights at both local and national levels.

■ ***Using local materials to make livestock housing and equipment***

Local materials should be used whenever possible. Methods from foreign production systems are not always appropriate and may lead to unsustainable practices if applied without adaptation.

Most smallholder livestock can be kept in buildings and pens made from local materials, such as wood or sun dried bricks, thatch from local grasses and bush poles (see Figure 8). These materials are usually cheap and readily available at little more than the cost of farm labour. Indigenous does not necessarily mean basic and the scope for innovation in this area is considerable.

With regard to human health, less traditional materials may be necessary for surfaces that are in contact with food products and may harbour harmful bacteria or other pathogens if they are not cleaned properly.

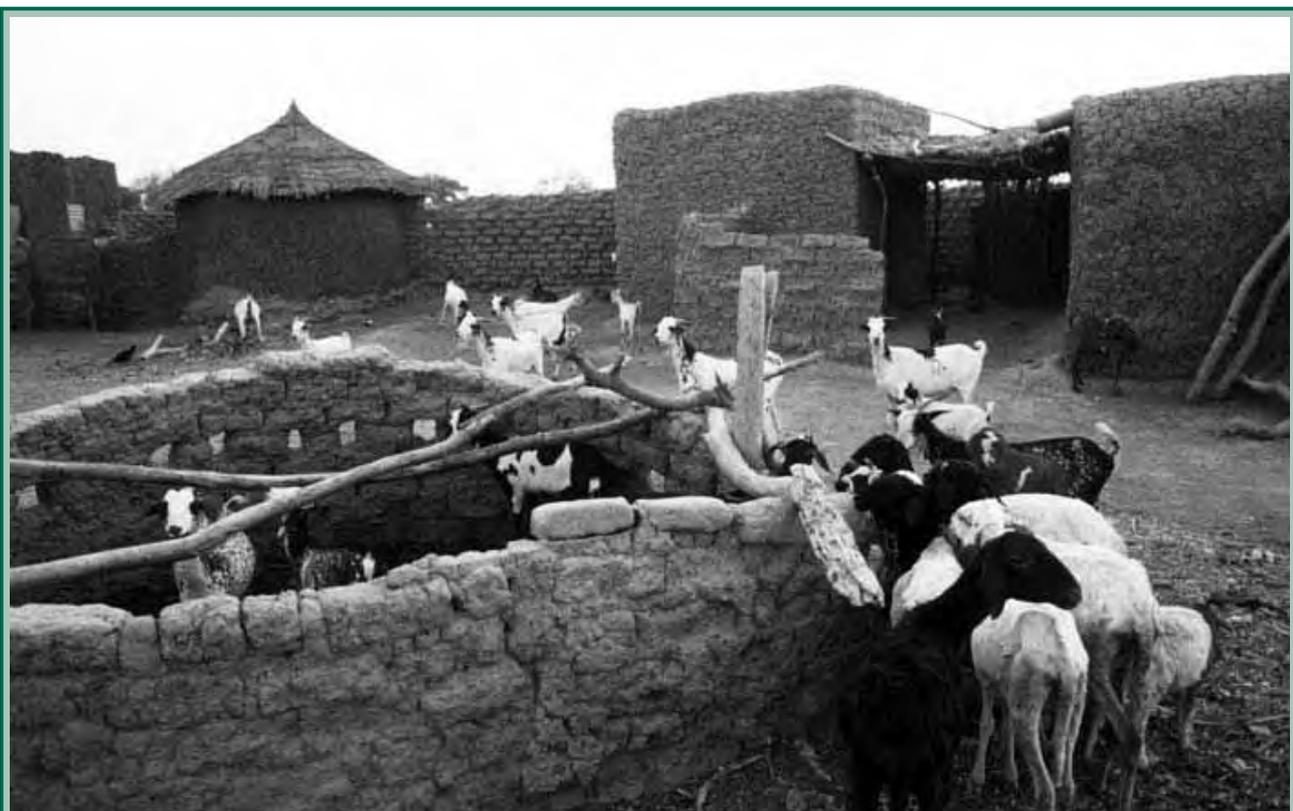


FIGURE 8 *A goat pen still under construction in Burkina Faso*
(Photo: © FAO/22152/A. Wagner)

■ *Labour needs*

Livestock can be labour demanding, even in extensive systems if they have to be guarded or herded. In more intensive systems, labour is required for cutting and carrying forage or other types of feed to the livestock each day. Children often undertake some of these tasks, but this may conflict with their formal education requirements.

In addition to feeding and tending animals, a regular supply of labour is required for milking. This is often carried out by women and may be combined with other domestic activities. Care is required to ensure that increased workloads do not conflict with women's other income earning activities or be detrimental to their health. For example, different methods of housing, fencing or tethering can assist in reducing labour requirements.

■ *Preserving livestock products*

Many animal products, particularly those intended for human food, are highly perishable. Damp conditions or poor storage lead to spoilage caused by bacterial infection. If the products are consumed immediately within the home, spoilage is not likely to be a problem. However, if they are marketed outside the household it may be necessary to convert them to a product that has a longer 'shelf-life',

thus preventing deterioration.

In some areas, meat preservation is common, by drying, smoking or preserving as cooked products. Examples include hams, sausages, dried meat, etc. Refrigeration or freezing may be necessary for some products and is likely to become more necessary as consumer awareness of quality and health increases.

Fresh milk is a highly perishable product because it is an ideal medium for bacterial proliferation and deteriorates quickly especially in hot and unhygienic conditions. Many traditional and modern preservation processes can be employed to extend the shelf-life of milk in fresh form including refrigeration and sterilization. These can be expensive but the value of the product, both to the consumer and to the health of the nation, justifies the cost. Milk is generally conserved by traditional methods in one of four groups of products: fermented milks; butter and butter oils; cheese and curds; and other milk products. Fermented products are often the result of natural souring; indeed this is such a common product that many people who rely on milk for much of their nutrition prefer soured to fresh milk. Unfortunately sour milk itself is susceptible to spoiling, if kept for long periods, and souring does not kill many potential pathogenic organisms,



FIGURE 9 In a small cheese processing plant, a woman holds a finished cheese, Honduras (Photo: © FAO/22051/G. Bizzarri)

such as bacteria of tuberculosis.

Whatever method of preservation or transformation is used, all products have a maximum shelf-life, after which they may become unusable. Many processes can be carried out at the household level, but the development of local processing plants, perhaps on a cooperative or group basis (see Figure 9) is also an option and may be more economic if there is a concentration of production in the local area.

Further information about food preservation methods may be found in FAO Diversification booklet No. 5 'Processed foods for improved livelihoods' (covering a variety of foods).

■ *Adding value to livestock products*

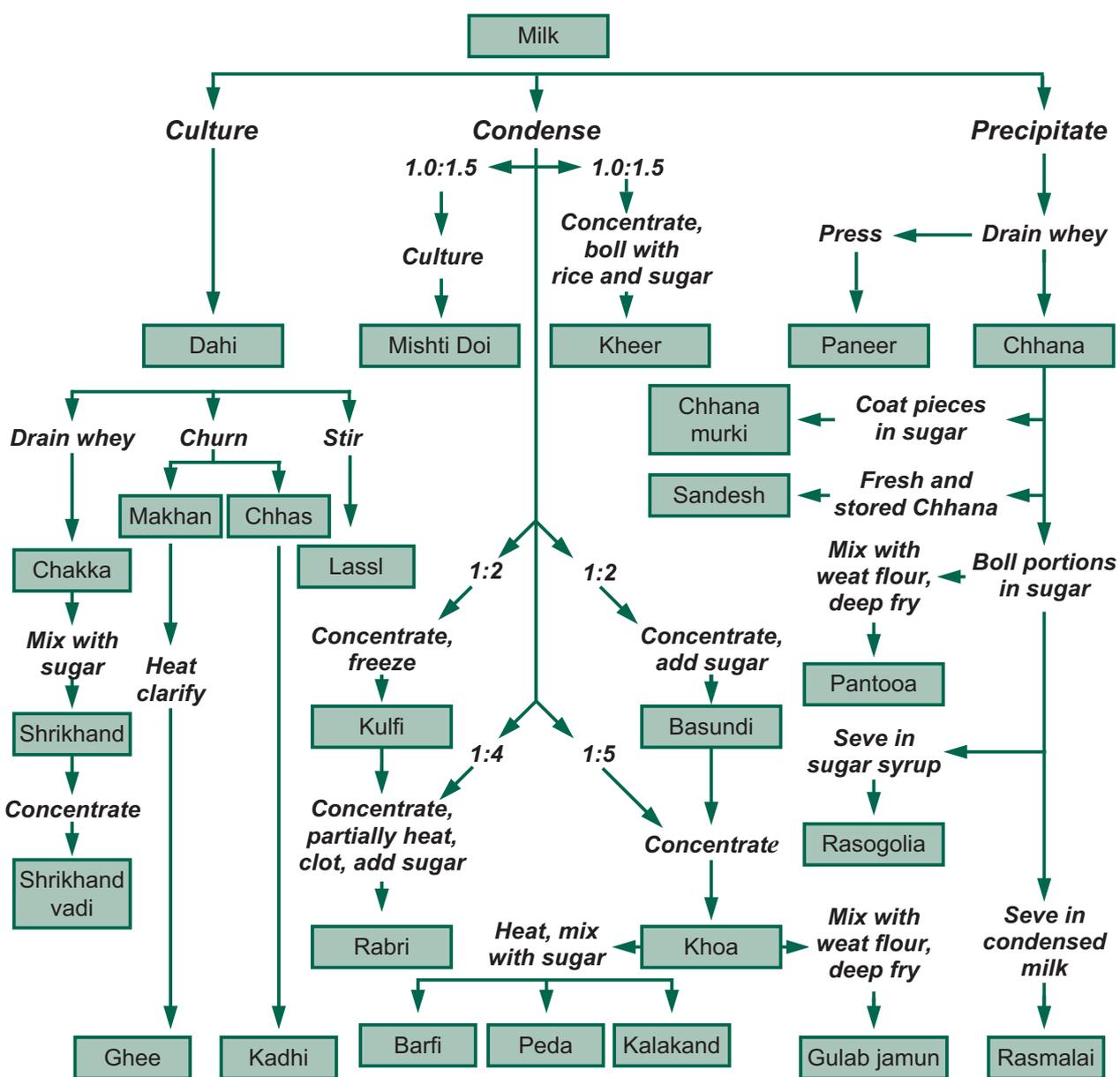
There are many opportunities at the household level to process edible and inedible livestock products in order to improve the income of livestock enterprises. Value can be added to fresh meat by traditional methods of preservation, including salting, drying and smoking. Under suitable climatic conditions of hot sun and a dry atmosphere, very good quality dry meat can be produced. Simple drying is suitable for small-scale production and avoids the high capital, operating and maintenance costs of more sophisticated equipment. For slightly larger lots simple solar driers, wood

fired driers, etc. can be used. Flavour can be added to dry meat by the use of salt and spices.

Smoking is less satisfactory as a preservative method: light smoking delays the onset of spoilage by a relatively short period, whereas

heavy smoking, although more satisfactory in terms of preservation, can have severe negative effects on the flavour and nutritional value of the final product. Consequently, smoking is often regarded as an emergency measure and other

FIGURE 10 Value added products from raw milk in India



Source: FAO. 1990. The technology of traditional milk products in developing countries. Animal Health and Production Paper No 85. Rome.

traditional methods of preservation are generally preferred. Modern methods of meat preservation include the use of refrigeration, for chilling and freezing, and canning.

Milk may be processed into a range of products such as cheese, yoghurt, butter and ghee. In some countries a multiplicity of products is made from raw milk (see Figure 10). There is considerable indigenous knowledge about such processes, many of which are commonly carried out at household level. Such activities are valuable and can lead to the creation of products that can be marketed over a much wider distance.

Adding value to non-food products can take many forms such

as the production of handicrafts, for example: wool may be washed, spun and made into yarns or cloths; animal skins may be cured and made into clothes, belts, bags, shoes, carpets etc.; and animal by-products can be made into candles and soap. If possible, priority should be placed on empowering households to add value and market their own produce. The equipment used should be carefully considered, appropriately selected, and suitable for use by poor households with limited levels of education. Further details about the production of hides and skins is available in the FAO Diversification booklet No. 8.

Support services for small ruminant production

■ *Sustainable services for all*

Small stock farmers need access to a range of inputs and marketing services. When such services are planned, their long-term delivery and sustainability must be considered. A major aspect of sustainability is the involvement of smallholders, particularly women, in planning and managing the services.

In the past the general situation of extension and farmer support has

been a broad sweep rather than a targeted promotion of interventions for particular groups. Livestock producers have usually had less support than crop producers and women are often neglected even though it is frequently recognised that they are extremely important to the agricultural sector and thus the national economy of many countries. The situation has changed in recent years in some areas (see Figure 11)



FIGURE 11 Rural woman receiving advice on sheep fattening in Senegal
(Photo: © FAO/22177/A. Casset)

and special services are now being provided for women producers (see Case Study 5).

One of the greatest deterrents to the growth of small stock production is the spread of animal diseases that result in a loss of production. The provision of resources to overcome this is essential through supplying appropriate breeds of livestock including exotic or cross

breeds (see Case Study 6), improving levels of feeding, and ensuring timely and focussed veterinary prophylaxis or treatment.

Once these aspects of livestock keeping have been addressed, other weaknesses in the sector may become apparent such as poor marketing and pricing arrangements, or the lack of indigenous knowledge. These issues

CASE STUDY 5 Services for women livestock keepers in The Gambia

Women are extremely important in the socio-economic development of The Gambia. In addition to being the principal managers and decision-makers in sheep and goat husbandry, women contribute to the production of swamp and tidal rice, horticultural crops and sesame.

In the past, women have lacked access to credit facilities, inputs for their farming practices including land, and, caused by the high illiteracy rate, access to extension information. One major limitation to improving the income from small livestock was the difficulty women faced in marketing their products outside their village environment.

Recent developments in tackling the issue of service provision to women livestock producers have included:

- the development of appropriate extension materials;
- the establishment of demonstration sites;
- the use of local extension worker-to-farmer contacts;
- the promotion of farmer-to-farmer dissemination;
- experience and observational learning;
- a limited number of vaccination interventions.

This approach has resulted in positive benefits for women livestock keepers. They have responded well to extension messages and have set up several organizations for their mutual benefit. Women extension officers have helped to deliver acceptable extension messages. Visits to similar farms in neighbouring areas have been productive and clearly demonstrated the value of farmer-to-farmer extension. The integration of extension activities with other rural services, such as combining the use of critical inputs with access to credit, were found to be a major component of success. The use of village demonstration sites encouraged the introduction and widespread dissemination of new techniques.

may, however, be addressed more easily once animal health constraints have been overcome or reduced to an acceptable level.

■ ***Access to technical and commercial information, loans and credit***

Small ruminant producers differ in many ways from keepers of intensive livestock or large stock. Because their enterprises are small, they are not very visible and their needs are often overlooked or underestimated.

Many small stock keepers are women and children who are usually excluded from the regular channels of communication. Consequently, sheep and goat keepers may find it difficult to gain access to technical information concerning livestock, livestock services, loans, credit facilities, savings mechanisms and marketing possibilities. As a result, the likelihood of making a success of their enterprise and achieving the potential benefits of their stock may be limited.

CASE STUDY 6 Appropriate goat breeds in Tanzania

Sarah is the chairwoman of a women’s group in Babati, Tanzania, and a member of the Toggenburg Breeders’ Association, which FARM-Africa assists with training and marketing. She lives with her husband, children and grandchildren. Sarah started keeping goats in 1991 and has sold eleven cross-breeds. She is immensely proud of her goats and of her status as the first woman in the area to receive the new breed.

“Before, my children were under-nourished, but now they are healthy and happy because of the milk. Money from the goats enabled my eldest daughter to go to secondary school and now she is a teacher working for the government. Any extra income we get from the goats pays for schooling.”

Sarah has one Toggenburg buck and four does. They are housed in a shed with a tin roof to keep out the wild animals that live in the nearby mountains. Brick walls ensure that the animals keep warm during the colder nights.

The women’s group will soon establish a credit scheme. All members will put in a small amount of money and give out loans for further goat-keeping activities, thereby enabling more families to benefit from the project. Sarah is certain of the difference that the animals have made to her life as she looks around her, at her thriving children and grandchildren. *“The goats have made my life very happy,”* she says.

In view of the large number of small ruminants in many countries and their potential contribution to the local and national economy, it is essential that policy-makers address the issues that prevent access to such services by small stock keepers. It may be necessary to make special provision for the delivery of appropriate services designed for the different needs of small-scale livestock keepers.

The provision of services, credit and physical inputs must be sensitive to labour division between women and men in livestock production. Particular attention should be paid to the ability of women to access such services and steps taken to overcome any barriers they may face.

■ *Veterinary services*

Each species of small ruminant, country or region has its own set of prevalent animal diseases. Whatever the disease, it must be handled in a cost effective way in order to create the framework in which successful livestock keeping can flourish. This may involve a combination of national veterinary services, particularly for diseases that need a national or even a transnational eradication policy (for example, Rift Valley Fever and Peste des Petit Ruminants - also known as goat plague) coupled with locally delivered interventions.

There are many alternative forms of delivering veterinary services. The traditional approach of government veterinary service, comprising a top-down structure of regional and district offices, has generally been unable to deliver services to local farmers as a result of a combination of inadequate funding, poor motivation amongst staff, and a failure of trust between farmer and veterinarian. More successful health delivery strategies have involved the private sector, the use of para-vets, community animal health workers and pharmacy-based services.

There is no one size fits all solution. Governments need to examine the question of how best to deliver veterinary services to smallholders and should not assume that the historical top-down approach is either the best or the only way. The discussion often centres on the provision of such services by public or private services or by non-governmental organizations (NGOs) and whether farmers should pay directly for these services.

The main need is often simple prophylaxis programmes that can be taught and delivered at the local level. More specialized veterinary knowledge may be needed in only a small number of cases. In each locality it should be possible to determine what are the most likely

disease threats and train farmers and para-vets to deal with them. In view of the close involvement of women and of children in the management of small ruminants, policy-makers and extension managers should ensure that they are provided with training in primary animal health care.

■ *Access to technologies and training*

Factors to be considered when determining training needs of small-scale livestock keepers includes whether livestock keeping is a traditional enterprise or has been introduced recently, the choice of animal species, the use of indigenous and modern technologies, whether farmers are settled or migrants, the effects of social changes and new work patterns, market opportunities for livestock products, and the wider issues of community decision-making and community well-being.

Indigenous knowledge should be harnessed wherever it can be found. However, with newer techniques, particularly those associated with processing and marketing livestock and their products, training will be important to the success of such activities. This may take the form of training in techniques suitable for small-scale household use or suitable for somewhat larger but still local processing plants.

Training may be delivered by central or local government agencies, NGOs, private organizations or farmers' groups. The scale and nature of small farm production means that training is more likely to be delivered in a cost effective manner, if it is delivered face-to-face at community level or remotely by radio or television. The design of the training programmes and identification of potential trainees should take account of the gender roles in livestock production. For example, if women are involved in household processing and marketing of small ruminants and their products, much of the training could be targeted at women's groups. Skills development plays a crucial role in the empowerment process.

■ *Input supply chains*

Many options for processing livestock products require the provision of specialized equipment or inputs including fresh water, packaging, dyes and other chemicals. Supply mechanisms and the availability of local products are critical for the sustainability of this process.

■ *Markets for produce*

Much of the output from small-scale livestock production is consumed in the home or sold or bartered with friends and neighbours. Encouraging and supporting smallholder access

to more formal markets is an additional means of generating cash and providing a wider outlet for surplus produce. Products need to be marketed in a reliable and cost-effective way. Assistance may take the form of market information about market opportunities, prices and quality requirements; transaction mechanisms between farmers and buyers; transport to more distant markets; transporting goods to market in smaller or larger lots; product advertising; the use of middlemen, the creation of local markets; and the provision of information to potential buyers about the existence of markets.

The creation of specialized markets, the use of agricultural shows, the setting up of food fairs, as well as the more traditional food markets, are possible outlets for surplus produce. More innovative methods to supply processing factories with bulk produce may be an option worth pursuing for farmer groups. A major factor for a successful operation of this kind is that as much control of the marketing process as possible remains in the hands of local livestock keepers.

■ *Transport*

Transport could be a key factor in the success of realizing the potential of sheep and goat resources. This relates to transporting the inputs required for processing livestock products as well

as transporting the final products to a distant market or outlet. Existing local transport arrangements may be adequate or adaptable to the marketing needs of small farmers. However, there could be special needs for perishable food products including refrigerated containers for milk or meat. Investment in such facilities is critical to the success of the small stock keeper and must be considered in relation to the throughput and sustainability of the marketing operation.

■ *Potential for establishing cooperatives and women's groups*

Livestock producer cooperatives and women's groups can provide a range of benefits to members including delivering technological messages, sharing best practices, joint purchasing of inputs, collective value-adding activities, product differentiation through labelling, risk reduction, securing higher prices and economies of scale through collective marketing, and providing access to credit and savings mechanisms.

■ *Food safety regulations*

In many parts of the world, the commercialization of small animal products, such as milk and meat, are becoming subject to food safety regulations which require approved

facilities for processing, such as pasteurisation plants or licensed slaughterhouses. As consumers become increasingly focused on quality and safety attributes, it is expected that regulatory frameworks will become more widespread, more stringent and have to be applied more frequently and more rigorously.

Under such a scenario, small livestock keepers wishing to market

their products must be informed of the food safety legislation that may affect their activities. The national body responsible for food safety is responsible for setting such regulations, generally based on Codex Alimentarius standards, and it also controls their implementation and should give such information to farmers and processors.

Challenges and opportunities

There are four main technical constraints which work against successful improvements and sustainability in small ruminant production and productivity:

- the genetic potential of indigenous livestock in need of improvement;
- the widespread distribution of livestock diseases;
- inadequate feed supplies and poor animal nutrition;
- poor marketing infrastructure and arrangements.

Non-technical constraints, such as the balance of operations and management between central and local governments, an almost universal absence of clear livestock development policies and strategies, the pace of privatization and the possibilities of cost recovery for goods and services, are also important factors constraining the development possibilities for sheep and goats.

Further disincentives to rapid development include a lack of rural services and infrastructure, a credit environment unsympathetic

to smallholder borrowers, weak financial services, and unclear land tenure policies. Once external funding is withdrawn, the continuity and sustainability of projects is often frustrated by absence of government support and little beneficiary participation in the concept, design and implementation of development initiatives. Capital investment and the provision of recurrent expenditure for livestock development are very often low, particularly in relation to the size and importance of small ruminant populations. In many countries, government support has actually decreased in absolute and relative terms over recent years. Increasing population pressure, uncertain rainfall, declining soil fertility, and traditional techniques continue to inhibit increases in animal output.

Consequently, despite the large number of small ruminants in the developing world, almost nowhere do they produce to their potential. Nevertheless, small ruminants do make a substantial direct contribution to national and household economies, and to food security. High value essential dietary proteins for people

are an important output of small ruminants. There is rapidly rising demand for livestock products especially from the urban populations that are escalating throughout the world. For small stock keepers in developing countries, there are specific markets for higher output of food products deriving from domestic animals in areas where the demand is greatest, the cost of production is lowest, and the potential for adding value is most favourable. Increased and more efficient production is therefore very important to overall development.

Small ruminants provide a very suitable base for increasing the supply of animal products. Comprehensive and coherent programmes for development of small ruminant production would seem to be the most appropriate way to confront the complex biological, technical and climatic factors, and associated policy issues with which these extremely useful animals have to contend.

There is also the possibility of improving the genetic potential of indigenous livestock for the increased and more efficient production of milk, meat, wool and skins. These are areas where, given an appropriate enabling environment, there is likely to be increased producer interest. Current economic policies in many countries now allow for much greater

private involvement in agriculture in general. There has been a rather slow private sector response to agricultural and especially livestock investment, because there are alternative attractive short-term opportunities in other sectors (especially transport, tourism and construction).

The challenges to guaranteeing food security and alleviating poverty require sustained increases in production and productivity. Farmers will respond to appropriate incentives, better market access and technology transfer. The possibilities of enhancing farm incomes from a high value product should not be overlooked.

Strategic options to improve small ruminant production include:

- prioritizing the development of the small-scale and traditional sector;
- continuing to re-orient the role of governments in creating an appropriate enabling environment;
- making more appropriate production technology available through research and extension;
- continued investment in human resources development, especially farmers;
- improving resource management by smallholder farmers;
- increasing beneficiary participation in efforts and rewards.

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Sources of further information and support

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Notes

Notes

SMALL RUMINANTS, SUCH AS SHEEP AND GOATS, FIT WELL INTO SMALLHOLDER FARMING SYSTEMS. Their grazing preferences enable them to feed on weeds, shrubs and other plants that other species of domestic animals tend to refuse. Their small size means they require less space than larger animals and they are less likely to damage and compact soils. They are easier to work with than large ruminants and are cheaper to buy and maintain. Moreover, under the right conditions, they can be quite prolific. The range of products produced by small ruminants is easy to market because demand is high yet largely unfulfilled. Hence there are considerable opportunities for smallholders to use such animals more effectively and efficiently and thus increase their contribution to livelihoods.

Sheep and goats are widely distributed throughout the world, but policy-makers and administrators tend to overlook their contributions to the economy, rural and peri-urban livelihoods, the empowerment of women, other marginalized groups and food security.

